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PLEA$E PAY YOUR 1973 DUE$ -- $EE ERCELL WOOLFORD

PRINCIPAL PAPER

THE KAMEHAMEHA SCHOOLS/BERNICE PAUAHI BISHOP ESTATE AND THE FORESTS OF THE BIG ISLAND

By Norman K. Carlson

Before launching into the substance of my remarks, let me take a few minutes to provide a bit of background information, and also clear up a number of very common misapprehensions.

The Kamehameha Schools/Bernice Pauahi Bishop Estate is a philanthropic institution, but, by well-documented law, the institution can direct its philanthropy only toward a single beneficiary. This beneficiary consists of those students who are educated in the programs financed by the net revenue produced by the assets of the Schools/Estate. As you know, these assets consist primarily of land.

I make some point of this, because not infrequently the assumption is made that the Trustees are free to support almost any worthy cause which appeals to them. Nothing could be further from the truth. The winds of compassion for all sorts of worthwhile activity may rage through the hearts of the Trustees, but as far as the Schools/Estate is concerned, they have only one alternative. In the words of the immortal Archie Bunker, "Stifle it." Law compels the Trustees, within the law and public policy, so to manage the assets of the Schools/Estate as to maximize the net revenue which can go to support the educational programs of Kamehameha.

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Fortunately the courts have taken an intelligent and farsighted view of how this responsibility is to be borne. The courts are quite willing to recognize that one must think of long term income potential as well as that which produces income today. As a matter of fact, it is this farsighted attitude on the part of the courts that has permitted the Trustees over the years to engage in a long-range and constructive approach to the management of their forestry lands or lands with a high potential for forest cultivation.

Many questions are raised from time to time about the land of the Schools and the Estate. There is only time on this occasion to note a few of the characteristics.

The present Trustee holdings consist of about 368,000 acres. This is roughly nine percent of the land in the State. By islands, the lands are located as follows:

Hawaii	78.9%
Oahu	15.9%
Kauai	3.2%
Molokai	1.3%, and
Maui	0.7%

Thus, in terms of total acreage, by far the larger bulk is on the island of Hawaii. But when it comes to income productivity, the Big Island actually does not produce proportionately. Much of this Hawaii land produces no income or low income as, for example, wasteland and gullies, land above the forest line, pasture land and agricultural land having low productivity. In the category of urban land use, Oahu produces over ninety times the rent that Hawaii does. In agriculture and other uses, Oahu generates seventy percent of the total rent and the Big Island only twenty-seven percent.

I shall not burden you with many more statistics but it is important to note that 54.1% of the land is in conservation, 42.9% in agriculture, 1.2% unimproved. This is 98.2% of the total land acreage owned by the Schools/Estate, but it produces only 13% of the total income. And this last figure I think is the fascinating one, three tenths of one percent of the total acreage in commercial, hotel/apartment and industrial use produces 53% of the total income received by the Schools/Estate.

Frequently asked is the question as to what the total value of the Schools/Estate land is. The truth of the matter is that this is a question simply incapable of being answered. I could tell you that in 1965, the book value was $203,000,000, or that in 1971 the tax assessment was $360,000,000 - both of these statements are true - both are almost equally meaningless. The true market value of the land could only be determined in the usual way by discovering the price a purchaser would willingly pay and at which the owner would willingly sell. Of course, this situation has never arisen and, for all sorts of reasons, never will. Let us then just settle for the fact that in total, this is a very valuable piece of real estate.

In 1958, we reported to the Trustees on the potential of Hawaiian Timber. The preface to that book reads:

> "The Trustees of Bernice P. Bishop Estate have, since 1890 and before the formation of an organized government forestry bureau, recognized the necessity for trees and other vegetation on their high and rough lands. It is from these forest areas that the water comes which is so vital to life, agriculture and industry in the islands of Hawaii.
>
> "Almost twenty percent of the land owned by the Trustees of Bishop Estate has been set aside as Forest Reserves, and on these reserves their main function to date has been the collection, percolation, and lead-off of the rain waters. In all, there are 86,060 acres of such land: 45,038 acres on Hawaii, 29,665 acres on Oahu, 9,450 on Kauai, 1,397 on Molokai and 1,209 acres on Maui.
>
> "The Trustees, in their long view of land use, have come to believe that there might be additional uses for these forest lands, a use not incompatible with watershed development."

It is from the ideas which underlay this preface or introduction that in 1959 we initiated a program of reforestation in the Honaunau Forest in Kona. Our premise relative to these forest lands was based on many different plot studies throughout the State, and on Trustees' plantings within the Honaunau Forest commencing in 1927 and continuing through about 1945. Within the Schools/Estate plots in Honaunau, an area of about 20 acres, there was planted redwood, Hawaiian ash, Australian red cedar, various eucalyptus, and other trees. Studying these plots, we anticipated regrowth on our other areas similar to that exhibited in this area.

The Honaunau Forest contains about 10,000 acres. It is in the South Kona watershed area. Over these lands about 100 inches of rain fall each year on the lower areas, and 45 inches on the Mauka. The soils of these lands are extremely variable; aa, pahoehoe soil, deep soil, and swamps. The cover over the forest was first logged in 1924. Logging ceased around 1942. However, the forest was prevented from regenerating due to the large number of wild cattle. In 1956 and 1957 we fenced the entire forest. The cattle were eliminated by permitting public hunting.

Let me summarize what we have done within the forest. From 1956 to 1970 we cleared and planted about 1,929 acres with 982,900 trees at a cost of $125,275. The trees and acreage planted is given in the table below:

Acreage	Trees planted
800	Hawaiian Ash
800	Australian Red Cedar
300	Pine, Eucalyptus, Alder, Queensland Maple

An expenditure economics analysis reveals the following: (1) Clearing cost in 1960 ran around $25 per acre - we then could hire a bulldozer from $12 to $18 per hour. In 1969 the cost of clearing was $42 per acre at which time dozer cost ran from $30 to $42 per hour. (2) Planting cost has increased from about $10 per acre in 1960 to over $34 per acre in 1969. (3) Total cost including administration and other miscellaneous costs averaged about $45 in 1960 and in 1969 averaged over $88 per acre. It is interesting to note that the Division of Forestry predicates a cost of $270 per acre for clearing, planting, and management. (4) Taxes since 1960 have doubled, although these are relatively minor. The

valuation within these forest lands has gone from $3.50 per acre to $7.00 per acre. However, it is anticipated that these values will increase materially within the next ten years.

Now, let us look at the potential return side of the ledger.

In our original study we anticipated logging at 35 years of age. This would have produced about $1600 per acre of stumpage predicated on a stumpage price of $40 per thousand board feet. However, present indications are that logging will have to wait for the 45th year.

If we go forward on this program initiated in 1960, it will now cost us over $100 per acre to clear, plant, and maintain. This, at eight percent compounded over 45 years, represents an investment of $3,100 an acre. However, if we can anticipate stumpage prices doubling or tripling within the next 10 to 20 years, then it is not unreasonable to assume a future value of $100 per thousand. At this figure the Schools/Estate still can make a small profit on the capital investment. It is of course possible that stumpage in the future might exceed this price projection.

If we knew exactly what the stumpage would be and bring in 45 years, and how citizens would react to our co-mingling the conservation and redevelopment of these wild lands, the answer would be clearer.

Let me detail a bit more what we actually have done within this Forest. The biggest cost on any of the wild forest land has been clearing, or preparing the area for planting. We have strip planted, going through the forest with a bulldozer, knocking down vegetation within a 14-foot strip, jumping another strip or so, and planting in between. We have applied herbicides on the ground and by air. Neither method has been very successful. The most successful method of area treatments prior to planting has been to clear all of the land and then plant 400 to 500 trees per acre.

After the trees are planted, the growth is quite rapid. Unless we have a drought, there is little danger from competing vegetation. We also tried another method involving cattle grazing in small areas designed to knock down everything before planting. Unfortunately, the cattleman who was supposed to have cooperated with us agreed to the principle, but not to the practice. The idea was sound, improper implementation produced failure. (Kikuyu grass is a real weed problem.)

What is the condition of the Honaunau Forest today? The koas are regenerating very well in some areas. In other areas there are none. The form of the koa is sometimes good, more often short trunked and spreading. Ash, cedar, eucalyptus are variable. Exotic tree growth is variable; some good and reproducing, some poor with limited growth. We have tried planting pines to control the growth of Hawaiian ash. It didn't work.

Now we must face the problem of - "What next?" Until we finish our studies of the forest plantings and related factors in 1973, the answer is uncertain. There are possibly only two routes to follow. One would involve the dedication of the forest for 20 years under Act 187 in which we would contract to leave the forest as is. Studies could continue by researchers. At the end of 20 years we might have an answer. This approach would maximize the possibility of maintaining my usual sunny disposition, for conflict with other citizens would be minimized. We might also be acquiring enough information really to know the ecology of these forests and their watershed possibilities and related necessities. Or we could leave the forest for 20 years, or 10 years, studying it, and perhaps coming up with an answer without dedication.

For the bird lovers - and I am one - it is interesting to note that in the deep forest, we find few birds. However, on the edges, going back and forth between the open pasture lands and dense forest lands, there are many birds. There simply are more birds within the planted areas and on the edges than in the deeps of the forest. An ornithologist is now studying the bird life of this forest.

Under our plantings, the native vegetation is in fact returning - lobelias, ieie, ferns, and many other native plants.

In order to keep this Honaunau Forest healthy we must continue hunting. The hunters, on permit, kill 400 to 500 pigs per year. If we don't maintain the hunting pressure we shall have little left. The pigs dig up the trees, bark the pines, disturb and destroy any tree regeneration.

Leaving the Honaunau Forest, let us proceed to a consideration of the Kilauea Forest Reserve. In Kau there are nearly 3,000 acres of a decadent, over-mature forest of koa and ohia. During the last two years we have contributed $8,500 to the International Biological Program study. This research has developed some tentative answers to the pig problems, koa reproduction and regrowth. Adjoining this 3,000 acres is the Keauhou Ranch now being logged. This ranch is under lease to C. Brewer & Co., Ltd. as a pasture leasehold. It contains about 27,000 acres of which possibly 5,000 acres were once a heavy stand of koa and ohia. During the past 20 years logging has continued on these 5,000 acres. We have been able to get more income from the logging than from the pasture lands. However, we do have a contract with C. Brewer to continue it as pasture. They need these pasture lands as a reserve for their Kau pasture lands which are subject to drought. As you know, this has been acute in 1973.

As far as the Kilauea Forest area is concerned, the conservationists, the bird people, the preservationists, and the ecologists want no disturbance in this forest. This, in my opinion, is fine if you want the forest to die and revert to fern. And in time the koa will be gone.

In order to maintain this forest, I believe it should be logged so as to get out the dead and the dying koas. Then the new koa stands can return. It had been suggested that we experimentally log about 5 acres. However, my experience has been such small experiments prove very little. I should like to go into this forest and take out the dead and dying koa from 200 to 600 acres over a period of three to five years. This would then open up the forest to regeneration of the koa and the ohia. It would involve sufficient acreage to allow the koa to return without the heavy damage by pigs provided, of course, hunting pressure is increased.

We have another problem related to the forest which, to be sure, does not involve physical assets, but certainly affects human assets. If we do not allow logging or must stop logging in the Keauhou Ranch area and the Kilauea Forest, we shall put 40 - 50 men out of work. They have families. It is an aspect of the problem the Trustees find impossible to ignore.

Surrounding this Kilauea Forest there are 10,000 acres of National Park land that has never been touched; Kulani has a large acreage; the State Forest lands of Olaa are quite large.

I hope we can log the Kilauea Forest along with the Keauhou Ranch, control the pigs and bring the forest back to a healthy condition. I also hope we can develop part of the Keauhou Ranch into a forest.

Turning from the Kilauea Forest, let me tell you about what we are doing on other Schools/Estate lands. In the Keauhou mauka areas of Kona we have 13 different fenced trial plots in which we have planted many exotic species. We expect to plant native species in these plots either this year or next year, whenever the weather becomes favorable. We are beginning also to fence out many of the hills within this area in which there are koa, sandalwood, ohia, and other native plants because goats and sheep congregate on these tall hills, and totally destroy the native vegetation. In time these mauka lands may be very valuable for recreational purposes. As such they would be more valuable if there are areas of native vegetation growing. We also have within the Kona and Kau areas entered into agreements with the State of Hawaii Director of Fish and Wildlife for Nene preserves. The one in Kona encompasses about 25,000 acres. The one in Kau about 10,000 acres.

Let me conclude, as a conservationist, perhaps - who knows - even an ecologist, I am responsible to the Bishop Estate for a program that is economically sound both in the short and long run. We need to know more fully where koa and ohia grow best, how to replant, grow and how to manipulate the forest. All of this knowledge we need to give us a good healthy native forest of koa and ohia, both of which could become very valuable in the future.

It is too soon to anticipate fully economic returns from our exotic tree plantings. However, I suspect that the plantings we have made will return income to the Trustees over and above the investment within the 45-year term, provided, however, that at the logging period we are allowed to log.

There is going to be a high demand for quality hardwood. This I know we can produce on these islands. I don't think there is any need to ice box the whole of all the wild lands. There is a real need to study the wild lands now in poor pasture, in brush, and in decadent forest, and relate these lands to the needs for water, wildlife, recreation, and timber.

What are the consequences of doing nothing with Hawaii's forest lands? Will they revert to their former state or will they further deteriorate? The State of Hawaii with a million and a half acres of forest lands on Hawaii may come up with an answer. However, will this answer be an answer for the private forest landowners who must pay land taxes, management costs, and finally give a return over and above costs. Watershed represents value, bird life, and plant species conservation are values, and very real values. But the education of the youth of Hawaii also involves values. Surely we should be possessed of enough intelligence, enough ingenuity to make our way toward a plan that will permit all of these values to be perpetuated in a harmonic balance.

EVENTS

Pati Point Natural Area, Guam

The U. S. Air Force, the Government of Guam, and the Society of American Foresters recently dedicated the Pati Point Research Natural Area, a coastline site at Andersen Air Force Base. The dedication on May 25, 1973, climaxed the final day of the Interim Session of the Pacific Science Congress, held at the University of Guam. Lieutenant General Gerald W. Johnson, Commander of the 8th Air Force, made the announcement before an appreciative audience of scientists, conservationists, and local educators. Carl Hawkes, Gov-Guam's first Territorial Forester, represented the Society of American Foresters at the dedication.

Action was first initiated 3 years ago by the Hawaii Section, SAF when conservationists from Gov-Guam, the University of Guam, the Air Force, and the Navy met with Craig Whitesell, Research Forester, U. S. Forest Service to discuss the establishment of natural areas on Guam.

The Pati Point Research Natural Area represents several "firsts." It is the first one in an Artocarpus forest type, the first in the U. S. Pacific Basin, and the first on Department of Defense lands. The area consists of steep cliffs, terraces, and strand, and covers about 750 acres at the northeastern end of the island.

The area is the primary roosting place of the Guam fruit bat (Pteropus maricanus). This bat has a wing spread of over 2 feet.

The flora occurring at Pati Point includes:

Large Trees

Artocarpus mariannensis - wild seeded breadfruit - 60 ft. high, dia. 2-3 ft. (incl. buttresses)

Ficus prolixa - "nunu" (Guam) - Banyan, "Strangling fig" - up to 30-50 ft. high. Trunk with numerous adventitious & prop roots may cover area 5-20 ft. dia.

Merrilliodendron megacarpum - up to 30-50 ft. high.

Pisonia grandis - up to 60 ft. high, trunk dia. 2-3 ft.

Elaeocarpus joga - "joga" (Guam) - 60 ft. high 1 ft. dia. (fruit bats said to eat flowers of this tree.)

Tristiropsis obstusangula - Radlk. - "faia" (Guam).

Intsia bijuga (Colebr.) O. Ktze - "ifil" (Guam) (Guam's official tree) 80 ft. high, dia. 3-4'.

Medium Trees

Ochrosia oppositifolia (lam) Schum. - "fago" Guam 25 ft. high 8" dia. - fruit bats said to eat fruit.

Pandanus fragrans Gaud. (P. tectorius Park) pandanus, "agkag" (Guam) or "kafu" - fruit bats said to eat fruit of this tree - 20 ft., dia. 6" dia.

Guamia mariannae (Saff.) Merr. - "paipai" (Guam) endemic genus to Mariana Is. - fam. Annonaceae 10-15 ft. high, dia. 4-5"

Cycas circinalis L. - "fadang" n "federico palm" (Guam) - cycad up to 8 ft., 7" dia.

Hibiscus tiliaceus L. "pago" (Guam) tree hibiscus "hau" (Haw) spreading tree up to 15 ft. high, dia. 7-8"

Macaranga thompsonii Merr. - "pengua" (Guam) up to 15 ft., dia. 6-7", have very large peltate leaves.

Aglaia mariannensis Merr. - "Mapunao" (Guam) 15-20 high 10" dia.

Undergrowth

Piper guahamense C. DC. - herb

Bikkia mariannensis Brong.

Asplenium nidus - large birds nest fern (epiphyte)

Ophioglossum pendulum - adders tongue fern (ephiphyte)

Orchids - (ephiphytic) incl. Taneniophyllum mariannense Schltr.

Along Rocky Shore - Typical strand plants incl:

Pemphis acidula

Scaevola taccada

Messerschmidia argentea

Bird species observed at Pati Point include:

Ptilinopus roseicapillus	Marianans Fruit Dove
Corvus kubaryi	Marianas Crow
Gallicolumba x xanthonura	White-Throated Ground Dove
Halycon c. cinnamomina	Micronesian King Fisher
Rhipidura rufifrons uraniae	Rufous-Fronted Fantail
Myiagra oceanica freycineti	Micronesian Broad Bill
Zosterops c. conspicillata	Bridled White-Eye

Since 1971, the Society of American Foresters has recognized over 270 natural areas. The SAF defines a Research Natural Area as one which is a physical and biological unit in as near a natural condition as possible, which exemplifies typical or unique vegetation and associated biotic, edaphic, geologic, and aquatic features. The unit is maintained in a natural condition by allowing physical and biological processes to operate, usually without direct human intervention. Natural areas are established by the Society primarily for purposes of science and education to:

- provide outdoor laboratories for the study of natural processes in relatively undisturbed ecosystems;
- provide benchmarks against which both harmful and beneficial effects of mancaused changes can be assessed;
- serve as reservoirs of genetic diversity;
- serve as outdoor classrooms for the education of those interested in natural forest landscapes.

C. D. Whitesell

Proposed Quarantine on Palms, Papaya, and Other Fruits

The State Department of Agriculture is proposing to prohibit the entry from all sources any Cocos palms, Christmas palms, Pritchardia, Washingtonia and any other palm which may be susceptible to lethal yellowing and other diseases. The Department is also proposing regulations to restrict introduction of (1) fresh fruits from Florida and Puerto Rico, and (2) papaya plants and fruits from all sources. This is to prevent the introduction of the Caribbean fruit fly. William C. Look, Chief Plant Inspector, advises that there will be a public hearing on proposed regulations. He invites comments.

Botany Student Award

Miss Mae Obata, Botany Student at the University of Hawaii, was selected as senior most likely to reflect highest credit in botany work. A plaque to this effect will be placed in St. John Hall. Miss Obata will also receive a copy of Marie Neal's book "In Gardens of Hawaii."

National Forest Natural Areas

In 1927, the U. S. Forest Service established the first Research Natural Area, to protect a sample of ponderosa pine type in the Coronado National Forest in Arizona. In 1931, eight more Natural Areas were set aside. The system now contains 100 areas representative of major vegetation types in National Forests. The 100th Natural Area in the National Forest system was dedicated on May 3, 1973. Designated as the Wheeler Creek Research Natural Area, the reserved area is in the Siskiyou National Forest in Oregon. The forest type is old-growth redwood, Douglas-fir, and tanoak.

(Ed.)

SOCIETY BUSINESS

Minutes of the Regular Meeting May 7, 1973

The meeting was brought to order by Ted Green at 7:40 PM. The minutes of the previous regular meeting were read and approved. The treasurer's report showed balances of $11,402.41 in the Neal Fund, $551.96 in checking and $117.59 in savings accounts. There were 48 members and 21 guests in attendance.

The Secretary read correspondence from the awardees of the 1973 Hawaii State Science and Engineering Fair. Expressions of gratitude to the Society were received from Isaac Maeda, Lee Imada, Patricia Uyehara, Lon Machida, Grant Nakayama, the awardees, and from Saul Price, Awards Chairman of the Fair. From the Friends of Foster Garden were received a letter of request for financial support towards the publication of an illustrated report on the recently completed inventory of plant materials in the Botanic Gardens in the City and County of Honolulu from information prepared by Dr. Earl Bishop and letters of support from the Bishop Museum and the Pacific Tropical Botanic Garden. A discussion followed especially about the cost of preparing the proposed inventory - $8,000 for 1,000 copies. An invitation to attend a conference entitled "Fresh Air, Pure Water - What's the Cost, Who Should Pay?" was received from the Center for Engineering Research, University of Hawaii.

Speaking for the Conservation Committee, Ruth Gay read a draft resolution in support of the establishment of the Ahihi Bay-Cape Kinau Natural Area Reserve on East Maui as part of the Hawaii Natural Area Reserves System. The resolution was passed as amended. She also reported on a meeting with the City Department of Parks about the Ala Moana drainage canal and on subsequent correspondence indicating that the Society's stipulations are essentially being followed.

Reporting for the Finance Committee, Ercell Woolford said that the membership had been reviewed which showed that 127 of 240 members had paid their 1973 dues.

Reporting for the Agricultural Advisory Committee, Ron Hurov introduced Phil Easterman who gave a brief summary of the phase-out of Molokai pineapples, his opinions on agricultural alternatives, their identification, and marketing follow-up, contrasting this with following the easiest economic out via tourism.

In NEW BUSINESS it was moved and passed that the Society continue its membership in the Nature Conservancy. Regarding the Friends of Foster Garden's request for financial support towards the publication of an illustrated inventory, the membership questioned the donation of money for a publication to be given away. The Secretary was authorized to make appropriate contacts regarding the format of this publication and report on this at the June Regular Meeting. Application blanks were sent to the Society from the Center for Environmental Education for a nomination from the membership to be a Director of the Center, term for one year. Dr. Sugawa announced the time and places of upcoming lectures to the Pacific Tropical Botanic Garden and the 4th Annual Lyon Arboretum Lecture.

Dr. Theobald then introduced the speaker, Dr. James F. Sutcliffe, Visiting Professor of Plant Physiology from the University of Sussex, England, who gave an illustrated talk on the "Gardens of Britain."

Hostess for the evening was Bea Krauss. A plant donation was held after the meeting.

The meeting adjourned at 9:30 PM.

W. Gagne

Summary from the compilation of "Citizen Group Recommendations for Environmental Protection" By Governor's Environmental Council

Hawaiian Botanical Society recommends:

Expansion of forestry research in environmentally-oriented areas such as the study of ohia dieback as related to watershed management, ecosystem structure in the Kilauea Forest Reserve, koa and tree fern silviculture, exclosure studies of feral animal impact on vegetation and evaluation of game animal habitats.

Expansion of forest management programs in exotic plant control and regeneration of the mamani forest on Mauna Kea.

Commencement of research leading toward understanding of the dynamic interaction between exotic and native plants and basic ecological relationships in the ohia-hapuu forests and toward the utilization of native species in afforestation.

Evaluation of reforested and afforested areas for future environmental planning.

More thorough research of commercial forestry in Hawaii prior to its inception. If commercial forestry is proved feasible, tree plantations should be established only in areas where the forest has been cleared previously - not in primary native forests which hold untold values and benefits for future generations through the findings of scientific research.

Testing the potential of a small-scale, koa-based commercial forestry industry on some of the inferior-producing tree plantations or on marginal pasture lands.

State preservation and retention of relatively undisturbed native ecosystems in their present state.

Preservation of Keaa Forest on the Big Island for its scientific and educational value to the community of Honokaa and to the State as an example of a remnant lowland forest dominated by the endemic native tree kopiko.

Establishment of specific management practices according to planned future needs of Natural Area Reserves and Wilderness Areas.

Consideration of the need for an environmentally sound definition of the regulations and responsibilities governing the introduction, transport and release of exotic animals to private lands.

Conversion of game management practices to a vegetation carrying capacity basis, to replace the current management which is based primarily on animal population size or reported hunter take.

Prohibition of the importation of any animals or plants detrimental or potentially harmful to agriculture, horticulture, health or natural resources.

Extermination of exotic mammals in endangered native ecosystems such as the koa mountain parkland on the Big Island.

Commencement of research leading toward the identification and description of habitats supporting rare and endangered endemic species (implementation of Act 49, 1972).

Adequate consideration of educational, scientific, cultural, recreational and aesthetic values of remaining urban plant collections in all development plans.

Resumption of projects in landscaping with native plant species by State nurseries.

Consideration of a landscaping program modeled on the program which designates a minor portion of building construction funds to the placement of art works in newly constructed buildings.

Rapid expansion of research in diversified agriculture as carred out by UH College of Tropical Agriculture to meet impending changes in agricultural production.

PUBLICATIONS

Bryan, E. H., Jr. (May) 1973
Man in Pacific Oceanic Ecosystems
Abstract: This 12-page paper attempts to outline, very briefly, some ecological and economic relations between man and four major types of environment in the tropical oceanic Pacific area, as modified by climate and the sea around them. These are: (1) low reef islands, including atolls; (2) raised limestone islands; (3) basalt volcanic islands, in various stages of development and decomposition; and (4) islands composed of rocks of greater age, found west of the "Andesite line." A short summary is given of each of these types of environment, especially as it affects man. It traces the coming of man into the Pacific, how he made a living, and what befell him under foreign domination, with tables of population figures. The object is to present a brief, overall frame of reference, into which more specific details can be fitted.
(Duplicated by the Pacific Scientific Information Center, Bernice P. Bishop Museum, Honolulu, Hawaii 96818.)

Krauss, Beatrice H. and Richard A. Hamilton (June) 1972
Bibliography of Macadamia. Part II. Subject Index. Hawaii Agricultural Experiment Station, University of Hawaii, Research Report 207: 1-177.

Nakasone, H. Y., J. A. Crozier, Jr., and D. K. Ikehara (June) 1972
Evaluation of 'Waimanalo,' a new Papaya strain. Hawaii Agricultural Experiment Station, University of Hawaii, Technical Bulletin No. 79: 1-12.

Stewart, Maria (editor) (October) 1972
The Bulletin. Vol. II(4): 61-80. Includes: Report from the Gilbert and Ellice Islands-John Gregg Allerton. Special Studies: Mosses; Mercury, Ieie-Maria Stewart. From the Nursery-Keith Woolliams. Pacific Tropical Botanical Garden.

Stewart, Maria (editor) (January) 1973
The Bulletin. Vol. III(1): 1-20. Includes: Report from the Gilbert and Ellice Islands Part II-D. Herbst - The Versatile Wiliwili-Maria Stewart. Summary of the Native Species in the Pacific Garden-Keith Woolliams. Pacific Tropical Botanical Garden.

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Coppicing to convert small cull trees to growing stock. Pacific Southwest Forest and Range Experiment Station, USDA Forest Service Research Note PSW-272: 1-4.

Warner, Robert M. (October) 1972
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Growth response of a thinned tropical ash stand in Hawaii...after 5 years. U. S. Forest Service Res. Note PSW-227. Pacific SW Forest and Range Experiment Station, Berkeley, Calif. 3 pp., illus.

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THE HAWAIIAN BOTANICAL SOCIETY NEWSLETTER is published in February, April, June, October, and December. It is distributed to all Society members for the purpose of informing them about botanical news and progress in Hawaii and the Pacific. News contributions and articles are welcomed.

THE HAWAIIAN BOTANICAL SOCIETY was founded in 1924 to "advance the science of Botany in all its applications, encourage research in Botany in all its phases," and "promote the welfare of its members and to develop the spirit of good fellowship and cooperation among them." Any person interested in the plant life of the Hawaiian Islands is eligible for membership in this Society.

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